GrapeLook: Space based services to improve water use efficiency of vineyards in South Africa

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Water Watch

Content

Today we want to present the **lessons learnt** during the **demonstration** of a **space based service** to **improve water use efficiency** in vineyards in South Africa:

- Problem addressed
- Description of service
- Project achievements
- Service applications
- Lessons learnt

Background: South Africa Water Act

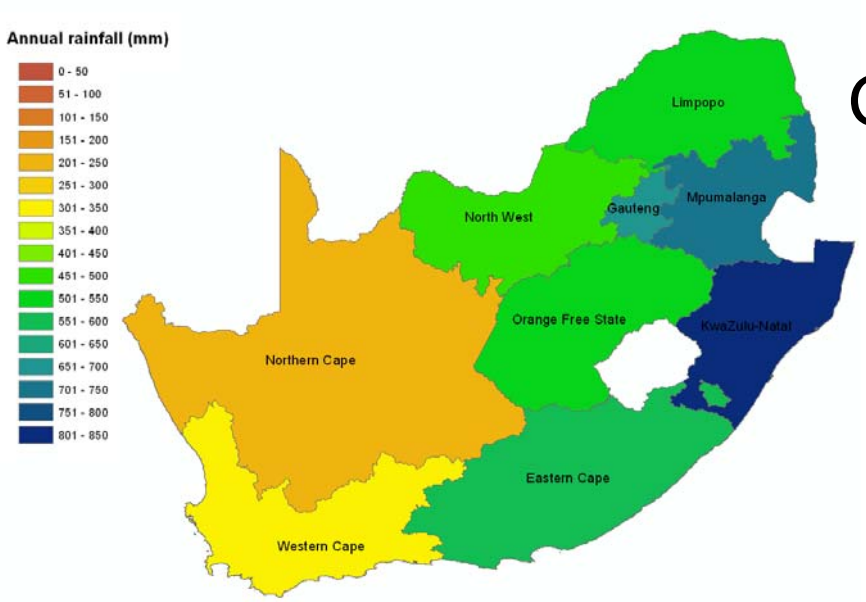
Water is a critical resource in South Africa:

- Changing climate (rainfall more variable)
- Growing population (more competition between urban, industrial and agricultural water sectors)

National Water Act (1998) states: "*water should be used more efficiently and has to be reserved for basic human needs and for protecting aquatic eco-systems first*"

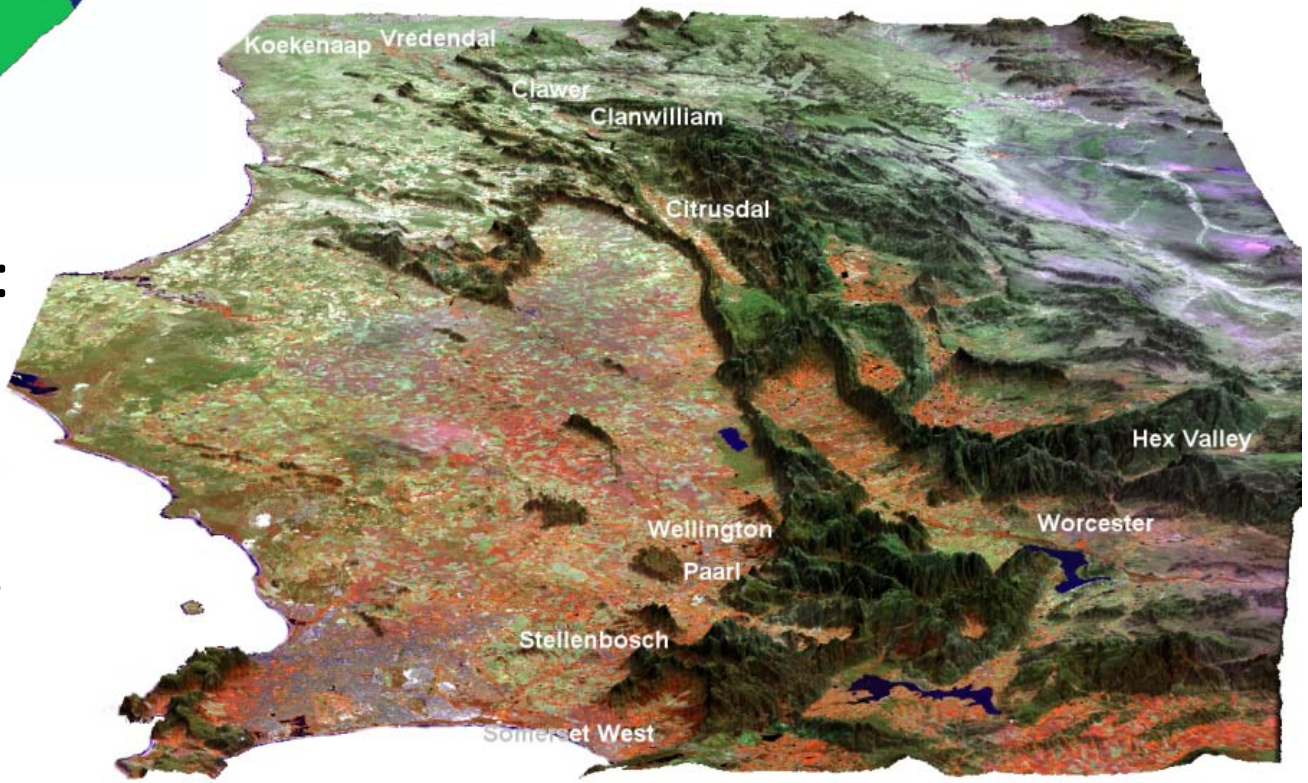
The result: **Less water available for agriculture**

Background: Western Cape



Grape industry is very important in Western Cape

Table grapes: 12,000 ha
Wine grapes: 96,000 ha
Sultanas (dried): 12,000 ha



Export Western Cape:

Fruits & nuts: 19.40%
Wine, beer & spirits: 12.51 %

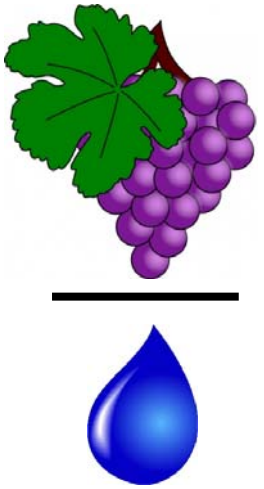
6.7% of adult persons (15-64) works in agriculture in WC

Concept of Water Use Efficiency (WUA)

WUE =  *Crop yield (kg)*

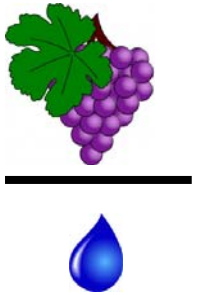
 *Water consumption (m^3)*

Improved water use efficiency:



Increase yield without increasing water consumption

or



Reduce water consumption without decrease in yield

Need to improve water use efficiency in vineyards in Western Cape province!
Spatial information on water use efficiency required.

Physical process behind water consumption is Actual Evapotranspiration (ET_{act})

Sophisticated earth observation algorithms can provide field level data on Actual Evapotranspiration and Water Use Efficiency worldwide.

GrapeLook Goal

To demonstrate an operational service that advises grape farmers in South Africa on water management and on-farm nitrogen application using satellite-based data

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—to improve water use efficiency; and

—to reduce input costs.

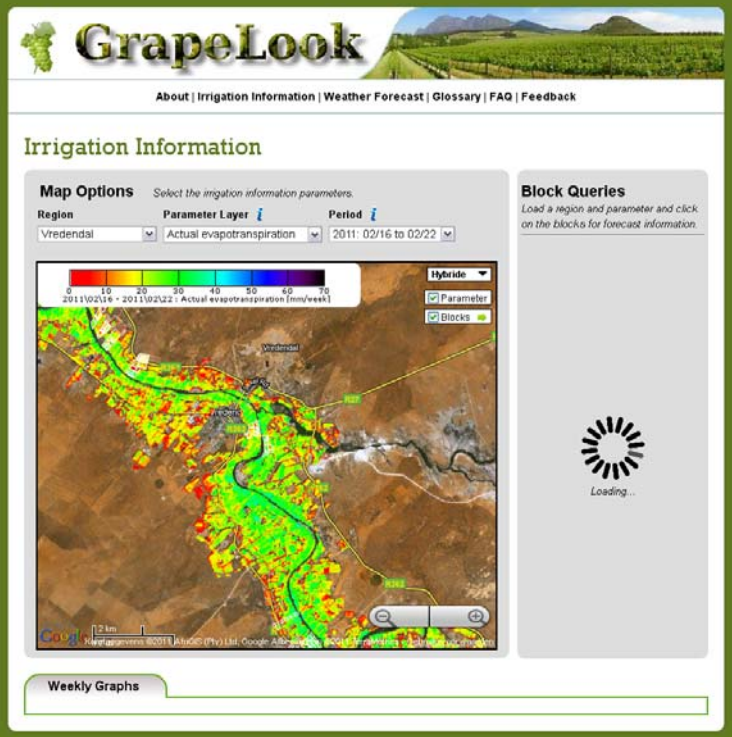
Objectives

- Provide weekly updated semi-real time information on parameters such as crop growth, evapotranspiration deficits and crop nitrogen status for individual blocks/plots and farms using satellite technology;

- Forecast soil moisture change over the five days after satellite image acquisition (for participating farmers only);

- Disseminate this information through a website (www.GrapeLook.co.za) accessible to all (farmers, irrigation consultants, etc.); and

- Enable farmers, water use associations, South African authorities and other users to evaluate the benefits of the operational service as a tool to optimize water use and fertilizer application.



Data availability

Data accessible to anyone through www.GrapeLook.co.za

Vineyards in:

- Stellenbosch
- Somerset West
- Paarl
- Wellington
- Worcester
- Hex Valley
- Vredendal

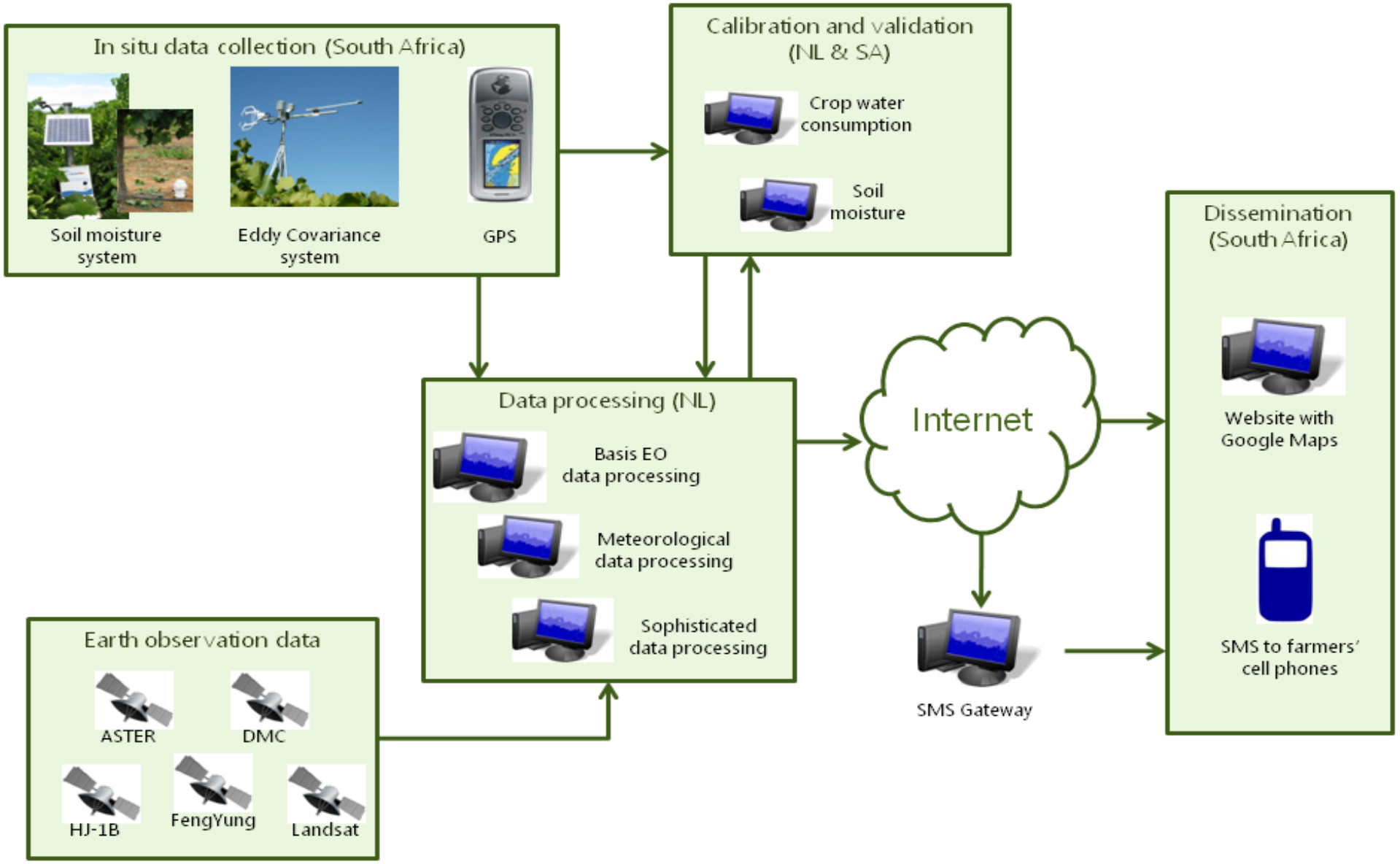
Parameters:

- Actual evapotranspiration
- Evapotranspiration deficit
- Crop factor
- Biomass production
- Biomass water use efficiency
- Leaf Area Index
- Nitrogen content

Forecasts:

- Soil moisture content
- Irrigation water requirements

Overview of the system



Irrigation Information

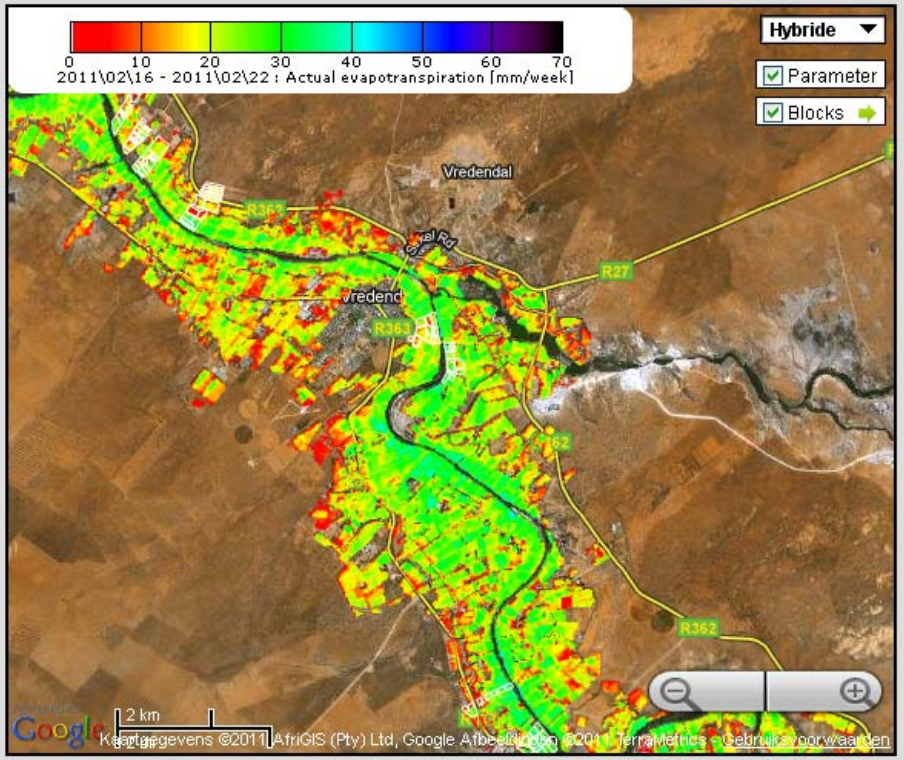
Map Options

Select the irrigation information parameters.

Region: Vredendal

Parameter Layer: Actual evapotranspiration

Period: 2011: 02/16 to 02/22



Block Queries

Load a region and parameter and click on the blocks for forecast information.

Loading...

Weekly Graphs

Data usage

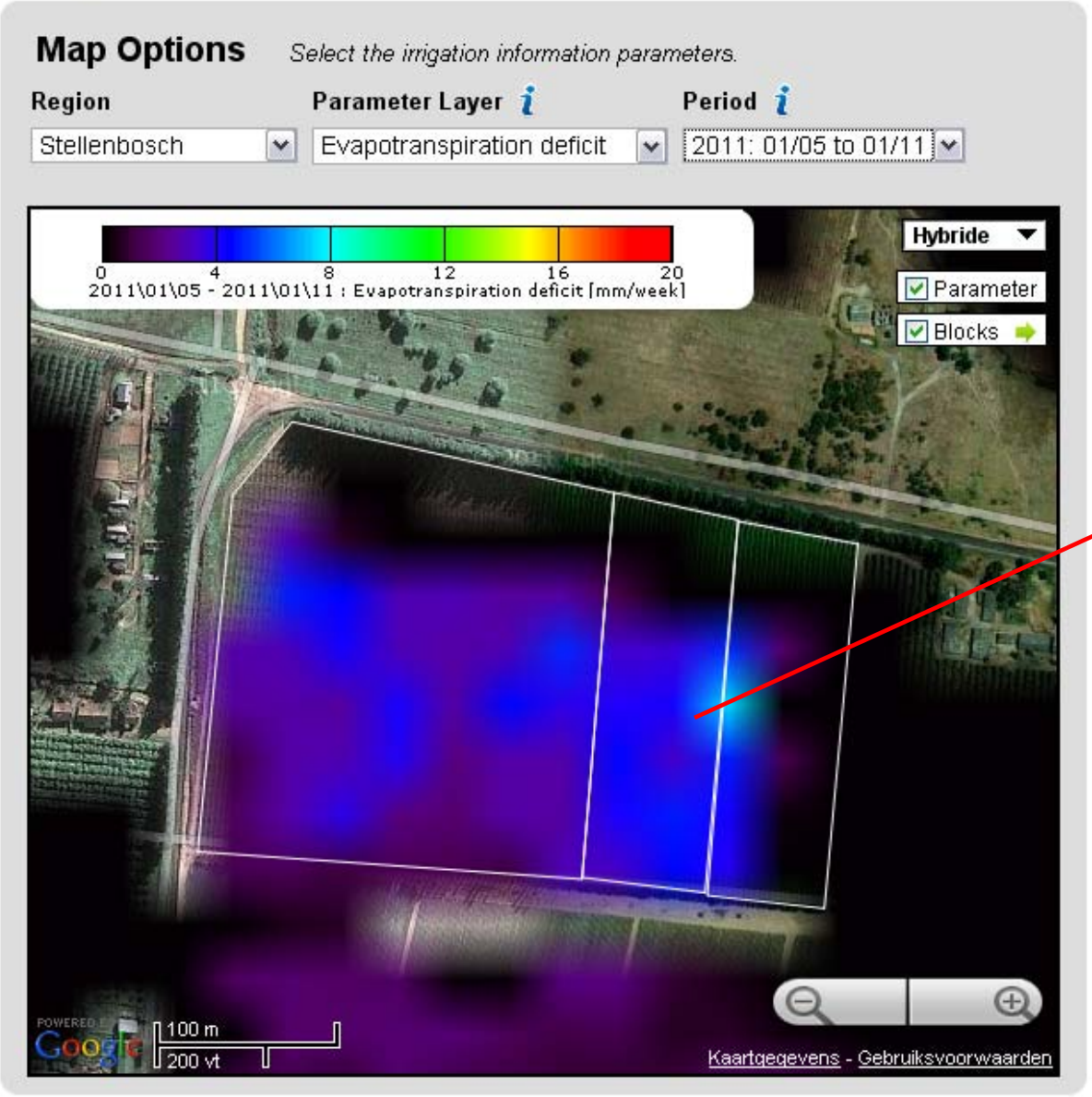


Table grapes
(one week before harvest)

Evapotranspiration deficit

Stones :
-> lower water holding capacity
-> more water stress
-> smaller berries
-> lower yield

Action:
Increase irrigation on stony parts of block with 1 mm/day until harvest

Data usage

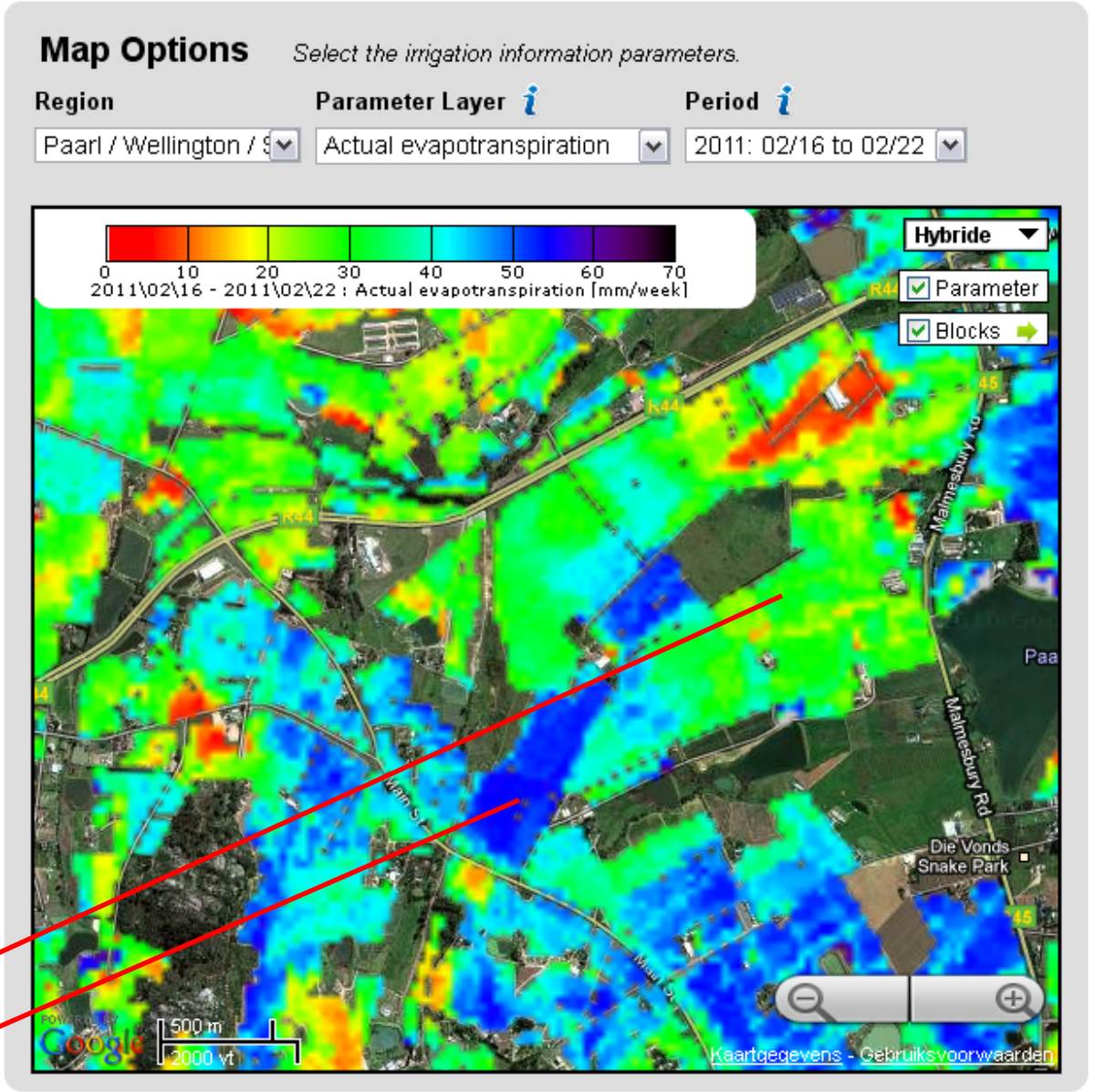
Table and wine grapes

Actual evapotranspiration

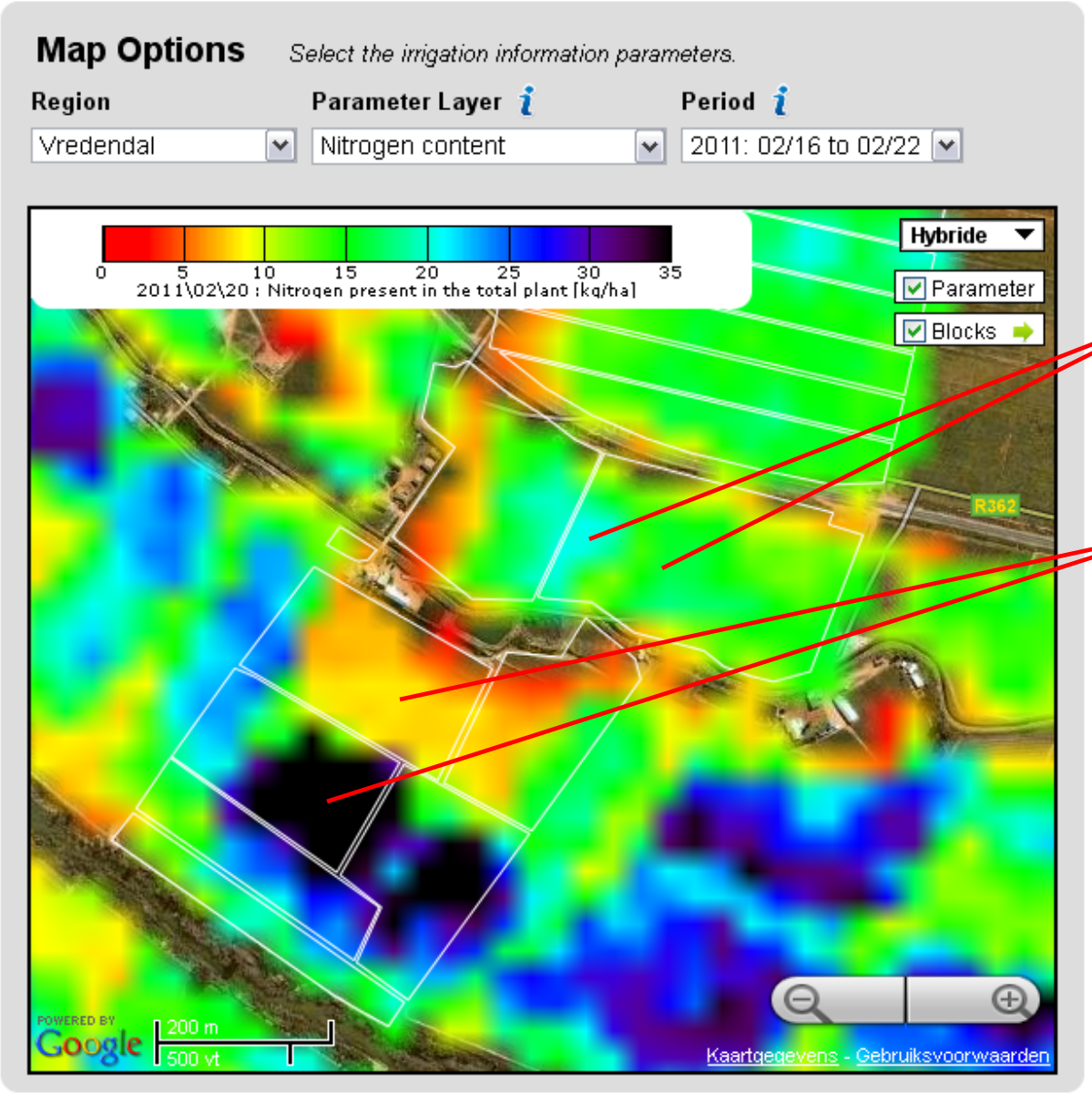
How effective is irrigation application?

What is the effect of cultivar, irrigation system and schedule, soil, management on water consumption?

How much more water do table grapes consume compared to wine grapes?



Data usage



Nitrogen content in vineyards

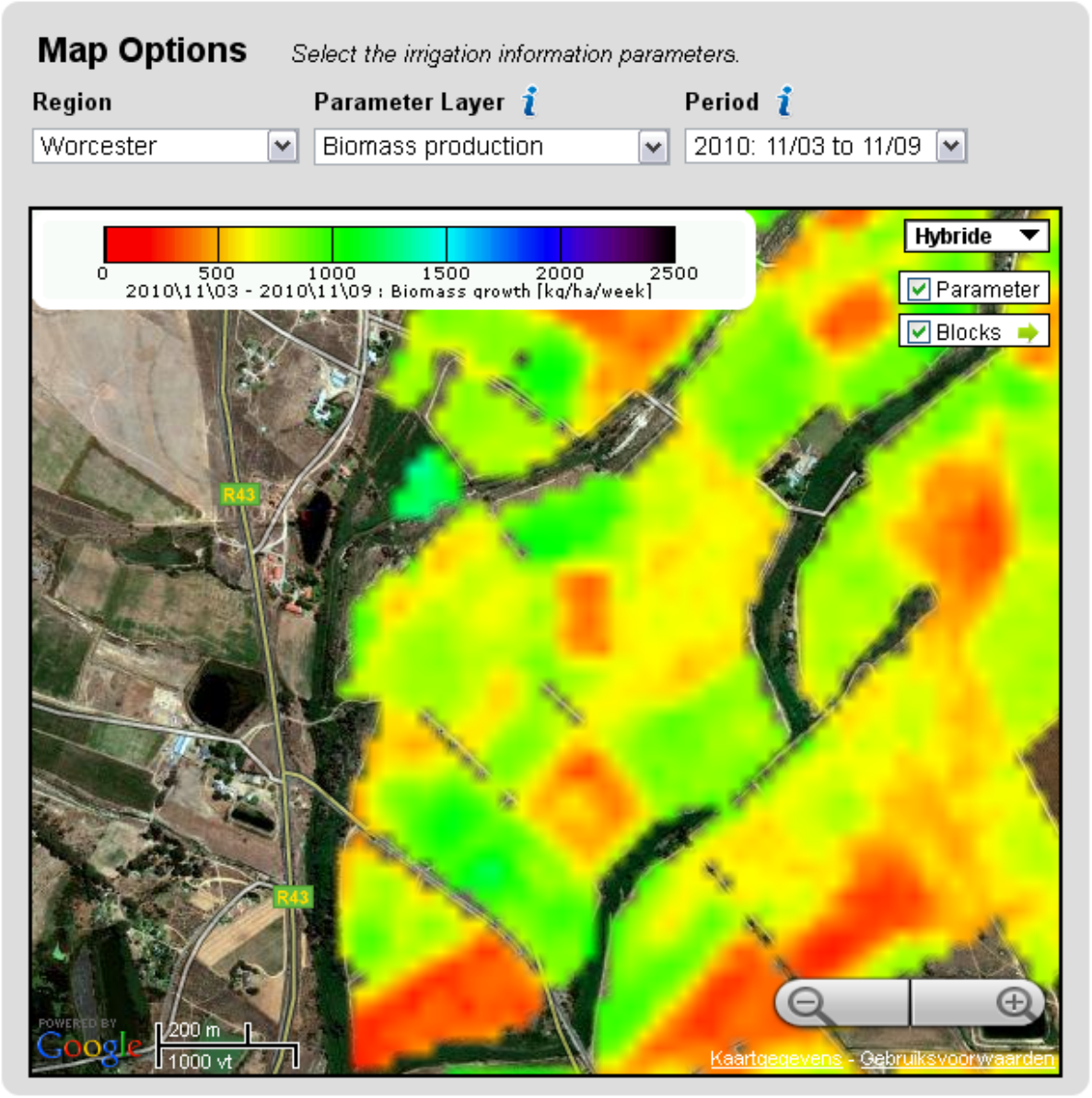
Some variation within blocks

Large variation between blocks

Nitrogen application:

- Reduce in some blocks
- Increase in some other blocks
- Need for precision farming in some blocks

Data usage



Biomass growth in November

Grape vigor affects grape yield. Extremely vigorous blocks need to be identified in an early stage.

Shoot stop growing is important data to know how plants are reacting to management (eg. Organic fertilizing vs chemical fertilizers)

Shows anomalies in block

Project outcome

- Development of the system behind the pre-operational service; and
- The demonstration of the system to the users.

Key lessons learnt (system)

- Strength of system = operates by using **different earth observation satellite resources**. *An operational service cannot rely on one resource as sensors may break down, prioritize other acquisitions and delivery may be delayed. E.g. earthquake in Japan delayed delivery of ASTER imagery.*

- The system combines **three space assets**: satellite earth observation, positioning and communication.

- The system behind the service is **robust and reliable** and was able to deliver weekly.

Key lessons learnt (users)

The success of the service was determined through:

- the **reliability** of the service (on time, regular);
- the **quality** of the service (trust);
- the **publicity** of the service (awareness);
- the website **usability** (user friendliness);
- the website **accessibility** (website speed);
- the **understanding** of information (definition of concepts); and
- the **usability** of information (translation into farm practices).

Conclusion

Users of GrapeLook (grape farmers in Western Cape) are open and willing to adapt new technologies subject to validation that the benefits are worthwhile.

To build trust and awareness within the farmer's community, the GrapeLook pre-operational service is envisaged to be sustained by institutional funds during the coming season 2011-2012.

In the coming years, GrapeLook will roll out in a commercial service in which farmers, farmers advisors and water user associations will have to cover the costs accordingly.